



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/336,687	06/21/1999	KEN'ETSU YOKOGAWA	500.37328X00	7949

20457 7590 04/06/2005

ANTONELLI, TERRY, STOUT & KRAUS, LLP
1300 NORTH SEVENTEENTH STREET
SUITE 1800
ARLINGTON, VA 22209-3873

EXAMINER

ALEJANDRO MULERO, LUZ L

ART UNIT PAPER NUMBER

1763

DATE MAILED: 04/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/336,687

Applicant(s)

YOKOGAWA ET AL.

Examiner

Luz L. Alejandro

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 November 2004.
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 67-72 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 67-72 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 67-72 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 67-line 15, it is unclear what the "means for adjusting an output of the second power source" is because the means are not clearly defined in the specification.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

Art Unit: 1763

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 67 and 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yokogawa et al., JP 9-321031 (machine translation) in view of Takagi et al., US 4,539,068 or Law et al., US 6,024,044.

Yokogawa et al. shows the invention substantially as claimed including a plasma etching apparatus comprising: a vacuum chamber 101 including vacuum generating means (see figure 1 and paragraph 0017); a sample stage 111 installed in the vacuum chamber for holding a sample thereon; a planar plate 107 disposed in parallel with the sample stage in the vacuum chamber; means for generating plasma in a space between the sample stage and the planar plate including electromagnetic wave supply means 104 and magnetic field generating means 102; a first power source 116 for applying a bias to the power plate; a second power source 112 for applying a bias to the sample stage; gas supply means 116 for supplying a source material gas into the plasma generated in the vacuum chamber, and wherein a distance between the planar plate and the sample held on the sample stage is spaced in a range from 30 mm to one half of the smaller of one of a diameter of the sample and a diameter of the planar plate (see paragraph 0021).

Yokogawa et al. does not expressly disclose the claimed means for generating plasma. Takagi et al. discloses a first power source 13 which supplies a first electromagnetic wave of UHF to the planar plate; a second power source 113 which supplies a second electromagnetic wave to the planar plate; a filter (15,115) which

Art Unit: 1763

supplies a superposed electromagnetic wave of the first and second electromagnetic waves; a first tuner 14 arranged between the first power source and the filter, a second tuner 114 arranged between the second power source and the filter, and where the planar plate 4 includes a plurality of holes, and the source material gas is supplied through the plurality of holes (see fig. 3 and its description). Furthermore, Law et al. discloses a first power source 60 which supplies a first electromagnetic wave of UHF to the planar plate; a second power source 50 which supplies a second electromagnetic wave to the planar plate; a filter (54,64) which supplies a superposed electromagnetic wave of the first and second electromagnetic waves; a first tuner 62 arranged between the first power source and the filter, a second tuner 52 arranged between the second power source and the filter, and where the planar plate 126 includes a plurality of holes, and the source material gas is supplied through the plurality of holes (see fig. 1 and its description). In view of these disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Yokogawa et al. so as to include the plasma generating means of Takagi et al. or Law et al. because such a means allows for the formation of a high quality plasma.

With respect to claim 70, note that Yokogawa et al. discloses that the electromagnetic wave supply means to generate the plasma provides a frequency from 300-500 MHz (see paragraph 0017).

With respect to the limitation that the second power source supplies electromagnetic wave for controlling a radical in the plasma, note that such limitation is directed to a method limitation instead of an apparatus limitation, and since an

Art Unit: 1763

apparatus is being claimed as the instant invention, the method teachings are not considered to be the matter at hand, since a variety of methods can be done with the apparatus. The method limitations are viewed as intended uses which do not further limit, and therefore do not patentably distinguish the claimed invention. The apparatus of Yokogawa et al. modified by Takagi et al. or Law et al. is capable of using the second power source to supply electromagnetic wave for controlling a radical in the plasma.

Claim 69 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yokogawa et al., JP 9-321031 (machine translation) in view of Takagi et al., US 4,539,068 or Law et al., US 6,024,044 as applied to claims 67 and 70 above, and further in view of Collins et al., US 6,054,013 or Toshihisa et al., JP 07-310187 or Collins et al., US 6,074,512.

Yokogawa et al., Takagi et al., and Law et al. are applied as above but do not expressly disclose a ring-shaped member including means for control of the temperature of the ring-shaped member. Toshihisa et al. discloses a plasma etching system including a protective ring-shaped member 6 disposed in a periphery of the sample, and means 19 for controlling the temperature of the ring-shaped member (see abstract, figs.1-2 and paragraphs 0006-0010 of the machine translation). Collins et al. '013 also discloses a plasma system including a ring-shaped member 1050 disposed in a periphery of the sample, and means 2170/2175 for controlling the temperature of the ring-shaped member disposed below a surface of the ring-shaped member (see, for example, fig. 48A and col. 32-lines 55-60). Collins et al. '512, also discloses a plasma

Art Unit: 1763

system including a ring-shaped member 62 disposed in a periphery of the sample, and means 77 for controlling the temperature of the ring-shaped member disposed below a surface of the ring-shaped member (see, for example, fig. 4A and col. 12-line 40 to col. 13-line 8). Therefore, in view of these disclosures, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Yokogawa et al. modified by Takagi et al. or Law et al. so as to further comprise a ring-shaped member and means for controlling the temperature of the ring-shaped member because the ring-shaped member provides protection and confines plasma from escaping from the processing region and control of the temperature of the ring-shaped member improves precise control and reproduction characteristics of the plasma treatment by maintaining the ring-shaped member at a sufficient temperature in order to maintain the ring-shaped member at a sufficient temperature to ensure its favorable participation in the plasma process.

Claim 71 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yokogawa et al., JP 9-321031 (machine translation) in view of Takagi et al., US 4,539,068 or Law et al., US 6,024,044 as applied to claims 67 and 70 above, and further in view of Kaji et al., EP 0793254 A2.

Yokogawa et al., Takagi et al., and Law et al. are applied as above but do not expressly disclose a ring-shaped member made of one of the claimed materials of silicon, carbon, silicon carbide, quartz, aluminum oxide, and aluminum. Kaji et al. discloses a ring-shaped member 37 composed of silicon or silicon carbide and

Art Unit: 1763

connected to a high frequency power source 17A (see fig. 14 and page 15-line 9 to page 16-line 11). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Yokogawa et al. modified by Takagi et al. or Law et al. so as to further comprise a ring-shaped member of the claimed materials as taught by Kaji et al. because this allows for an increased plasma density and reducing of deposits on the ring-shaped member (see page 15, lines 9-27) which provides better process results within the apparatus.

Claims 68 and 72 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yokogawa et al., JP 9-321031 (machine translation) in view of Takagi et al., US 4,539,068 or Law et al., US 6,024,044 and Kaji et al., EP 0793254 as applied to claim 71 above, and further in view of Sakamoto et al., US 5,698,062 or Danek et al., US 6,155,198.

Yokogawa et al., Takagi et al., Law et al., and Kaji et al. are applied as above but do not expressly disclose connecting the power source to the ring-shaped member where the power is divided from the second power source into one part for the sample stage and another part for the ring-shaped member. Sakamoto et al. discloses a plasma processing reactor in which a RF power supply 142 has a first RF signal output coupled to a first electrode and a second RF signal output coupled to a second electrode (see, for example, fig. 10 and col. 1-lines 43-52, col. 2-lines 3-5, and col. 9-line 35 to col. 10-line 10). Additionally, Danek et al. discloses a plasma processing reactor in which a RF power supply 142 has a first RF signal output coupled to a first

Art Unit: 1763

electrode and a second RF signal output coupled to a second electrode (see, for example, figs. 3, 4a-4c and col. 5-line 58 to col. 7-line 13). In view of these disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Yokogawa et al. modified by Takagi et al., Law et al., and Kaji et al. so as to divide the power from the second power source into one part for the first electrode (sample stage) and another part for the second electrode (ring-shaped member) in order to avoid difficulty in controlling plasma due to two radio frequency oscillators interfering with one another and their waveforms being distorted, and in order to make the apparatus simpler in structure and minimize its size.

Response to Arguments

Applicant's arguments with respect to claims 67-72 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not

Art Unit: 1763

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luz L. Alejandro whose telephone number is 571-272-1430. The examiner can normally be reached on Monday to Thursday from 7:30 to 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Luz L. Alejandro
Primary Examiner
Art Unit 1763

April 4, 2005